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From: Officer in Charge, Artificial Limb Department
To: Medical Officer in Command

Subj: Monthly Report of the Experimental Work of the Artificial Limb Department

Ref: (a) Advisory Committee on Artificial Limbs ltr dtd 21 Jun 1948

1. Monthly report required by reference (a) is hereby submitted.

2. A set of prostheses are being forwarded, in compliance with a request from the Australian Government to be furnished with a set of the prostheses being manufactured at Mare Island.

3. A number of prosthetic parts, including feet, ankle joints, wrist couplings, and below-knee aluminum joints have been shipped to the Veterans Administration, 252 Seventh Avenue, New York City.

4. The following projects are under production, experimentation and further study:

(a) Lower Extremities Section:

I. Foot and Ankle

Four new designs of the cable ankle joint have been completed and it is intended that they be tested to determine the amount of increased rotation which has been given to the joint. It is expected that the range of resistance to rotation and torque will be in the neighborhood of three to four inch pounds per degree. This has been accomplished by the design of the rubber block and by making it in two sections, which also has the advantage of allowing changes in durometer between the front and back bumper sections. A machine is being designed in order to compute the various resistances to motions about the ankle. It is contemplated to then take a large number of ankles that have been fitted to the desires of the individual amputees and to compute the range of motions and the resistances and stresses which actually occur in the ankle when in use on amputees.

II. Shank

The dies for the new cosmetic shank are still being constructed in the Navy Yard.

III. Knee

(A) Mechanical.

The variable cadence knee joint has been fitted on a number of amputees and it appears that this simple mechanical knee joint fulfills the requirements

of an artificial knee joint. These requirements are:

(1) Ability to flex the knee in ranges of 120 to 125°.

(2) Provision for allowance of the end of the socket to rest the top of the knee bolt.

(3) A braking mechanism which will occur in the end of the swing phase simulating the action of the hamstring muscle.

(4) A braking mechanism occurring at the beginning of the swing phase simulating the action of the quadriceps muscle.

(5) Allowance in the knee joint to permit the amputee to walk slow or fast without readjusting the knee joint.

(6) Absence of braking the mechanism furing the middle of the swing phase.

(7) Simplicity, lightness, and economy of cost.

(8) Ready adjustment to comply with the individual requirements of the various amputees.

(9) A simple, single, manual adjustment in the front that can be be done by the amputee.

(10) A knee joint which requires the minimum amount of effort on the part of the amputee in order to flex the leg and walk.

Although rotation is desirable in an above-knee joint, it is not necessary providing rotation is allowed in the prosthesis in another area-- for example, the ankle joint.

This knee joint does not provide for a knee lock, which is desirable-- especially in disarticulation, short stumps, old people, and amputees who have a phobia of falling. It is believed that approximately twnety-five percent of all above-knee amputees could use a knee locking mechanism to advantage. A knee-locking knee joint is being designed. This knee joint is expected to utilize entirely different principles than have been used heretofore.

(B) Hydraulic

The hydraulic knee lock used in the tilting table prosthesis is working satisfactorily with the exception that the cylinder has a moderate bleed which interferes with standing. The mechanism is being checked in order to eliminate the bleed.

IV. Cosmetic Problem

Additional cases are being fitted with 1/8" Rubbertex for a cosmetic covering of the shin. A patient has returned from Hawaii who has been wearing the cosmetic covering for the past six months. The effects of the tropice have

been negligible on the cosmetic covering in both deterioration and color changes in the material.

V. Brief summary of status of models as a unit.

A majority of above-knee suction sockets are now being fitted with soft backs, which are proving very satisfactory.

A walking machine has been constructed and is about ready to go into operation. This unit will be used for life testing the foot, ankle and shin under accelerated conditions utilizing weights applied on the prosthesis equivalent to weight applied by the amputee.

(b) Upper Extremities Section:

I. The above-elbow arm is being re-designed to include an elbow lock. About thirty percent of the above-elbow amputees requested to be provided with an elbow lock.

II. Hands, Hooks, and Tools.

The Army lock with the hand is re-designed, which is necessary in order to incorporate it into the Robinson hands.

III. Cosmetic Problem

No work has been done on the cosmetic problem of the arm this month.

IV. Harness and/or other outside control.

Cable control units are still giving the most trouble in the arm prosthesis. They are deficient from the standpoint of:

(1) High degree of friction with the consequent loss of power and transmission, especially after being in use for several months.

(2) The breakage rate is high. Some amputees will break a cable in a matter of a few weeks, while others are able to use the cable without breakage for a year.

The entire problem of transmission of power and motion requires a complete review. This includes cable fasteners and cable posts, both from the standpoint of wear and tear on the clothing and durability and breakage.

V. Brief summary of status of models as a unit.

A bilateral, pectoralis, cineplastic case has been tested for motor function at the University of California. At the present time the patient being fitted with artificial arms is undergoing a course of physiotherapy in order to strengthen the muscle motors and to teach neuromuscular coordination in order to separate the functions of the shoulder and the pectoralis motor. The patient is progressing satisfactorily and the muscle power in his motors is rapidle improving.

T. J. CANTY